HHS Public Access

Author manuscript

J Health Psychol. Author manuscript; available in PMC 2017 September 01.

Published in final edited form as:

J Health Psychol. 2016 September ; 21(9): 1949–1955. doi:10.1177/1359105315569093.

Associations of health behaviors with human papillomavirus vaccine uptake, completion, and intentions among female undergraduate students

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Abstract

This study explored associations between health behaviors and human papillomavirus vaccine receipt/intentions among female undergraduates. Participants (N = 286) completed a survey assessing human papillomavirus vaccine uptake (receiving 1–3 shots vs no shots), completion (receiving 3 shots vs 1–2 shots), and intentions as well as various health behaviors. Human papillomavirus vaccine uptake and completion were associated with receipt of other preventive medical care; completion was associated with having a regular healthcare provider. Among unvaccinated students (n = 115), increased human papillomavirus vaccine intentions were associated with flu shot and human immunodeficiency virus test receipt. Findings suggest promoting human papillomavirus vaccination with other preventive medical care might improve vaccine receipt.

Keywords

cancer; health behavior; health care; human papillomavirus vaccination; sexual health

Human papillomavirus (HPV) infections have been associated with increased risk of human immunodeficiency virus (HIV) and can result in genital warts, recurrent respiratory papillomatosis, and various cancers such as vulvar, vaginal, anal, and cervical cancers (Centers for Disease Control and Prevention, 2014). Spread by sexual contact, it is estimated that 79 million Americans are currently infected with at least one strain of HPV (Centers for Disease Control and Prevention, 2014). Currently, there are two HPV vaccines licensed by the Food and Drug Administration, Cervarix® and Gardasil®. These vaccines represent important steps in reducing cervical cancer incidence and mortality and are now routinely recommended for females aged 9–26 years (Centers for Disease Control and Prevention, 2014).

Despite the benefits of HPV vaccination, a recent national survey found that only 45 percent of female undergraduate students had initiated the 3-shot vaccine series (Lindley et al.,

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Declaration of conflicting interests: The authors declare that there are no conflicts of interest.

2013). These findings are especially concerning given that women's cumulative incidence of a first-time HPV infection is approximately 32 percent within the first 2 years of college (Winer et al., 2003).

Previous studies with female undergraduates have examined demographic and psychosocial correlates of HPV vaccine receipt and intentions (Lindley et al., 2013; Ratanasiripong et al., 2013); however, an important gap in the literature is the examination of their relationship to a range of protective and risky health behaviors. Identifying relationships between health behaviors will inform the development of interventions targeting multiple health behaviors (e.g. Moore et al., 2012). Thus, this study examined associations between various health behaviors (i.e. receipt of health care, such as vaccines and medical visits, physical activity, fruit and vegetable intake, smoking, and alcohol intake) and HPV vaccine uptake, completion, and intentions among female undergraduates.

Method

Participants and procedures

Following Institutional Review Board approval, female undergraduates were recruited from a psychology department research participant pool at a public Midwestern university in 2012. Eligible students were fluent in English and between 18 and 32 years of age. This age group was selected because the HPV vaccine was approved in 2006 for females aged 13–26 years (Brady et al., 2012). Thus, we were interested in recruiting participants for whom the HPV vaccine had been recommended.

After providing informed consent, students completed an anonymous password-protected online survey. The survey took place within a classroom in groups of up to 15 students spaced adequately such that privacy was protected. Following survey completion, a debriefing message was presented that included information regarding health services available on the campus. Students received course credit for their participation.

Measures

Demographics and medical history—Demographic information was collected and participants were asked whether they had been sexually active in the past 3 months (Penke, 2011). Six items assessed personal history of HPV, an abnormal Pap smear, or cervical cancer as well as knowledge of someone with these conditions (Centers for Disease Control and Prevention, 2012).

HPV vaccine uptake, completion, and intentions—After reading a definition of the HPV vaccine, participants indicated whether they had received the vaccine (Brewer et al., 2010). Those who had received the vaccine reported the number of shots they had received. Those who had not received any HPV shots were asked to report their HPV vaccine intentions (i.e. “How likely is it that you'll actually get the HPV vaccine?”; Gerend and Shepherd, 2012). Response options ranged from 1 (*very unlikely*) to 7 (*very likely*).

Health behaviors—Participants reported lifetime receipt of the hepatitis B vaccine, an HIV test, and a Pap smear as well as their receipt of a flu shot and a dental visit in the past

year (Centers for Disease Control and Prevention, 2012). Additionally, participants were asked whether there was a healthcare provider (i.e. doctor, nurse, or other health professional) that they saw most often (National Cancer Institute, 2012). Other health behaviors were assessed using well-validated and reliable measures, including items from the National College Health Assessment (NCHA) regarding average daily servings of fruits and vegetables and smoking status (Hoban, 2009), the Alcohol Use Disorders Identification Test (AUDIT) (Kokotailo et al., 2004), and the Godin Leisure-Time Exercise Questionnaire (LTEQ) (Godin and Shephard, 1997). The LTEQ provides a weekly physical activity score that corresponds to metabolic equivalent categories and values, including active, moderately active, and insufficiently active.

Statistical analyses

First, two HPV vaccine receipt variables were computed: HPV vaccine uptake (i.e. receiving 1–3 shots vs no shots) and HPV vaccine completion (i.e. receiving all 3 shots vs 1–2 shots). Next, descriptive statistics were computed to characterize participants' demographic information, health behaviors, and HPV vaccine uptake, completion, and intentions. Then, chi-square analyses and an independent samples *t*-test were used to examine potential differences between those who were sexually active in the past 3 months and those who were not regarding HPV vaccine uptake, completion, and intentions. Next, logistic regression models estimated the unadjusted univariate effects of health behaviors on HPV vaccine uptake and completion. Subsequently, two multivariate logistic regression models estimated the adjusted effects of all health behaviors on HPV vaccine uptake and completion. Similarly, linear regression models estimated the unadjusted univariate effects of health behaviors on HPV intentions. Finally, a multivariate linear regression estimated the adjusted effects of all health behaviors on HPV vaccine intentions.

Results

Descriptive statistics

A total of 286 undergraduate women participated in the survey. Data from one participant who did not report HPV vaccine status were omitted from analyses. When examining HPV vaccine uptake and completion, data from all participants who completed relevant survey items were included in analyses (age range = 18–32 years). When examining HPV vaccine intentions, only data from students who had not received the HPV vaccine and were 26 years of age or younger were included in analyses (age range = 18–25 years), as the vaccine is currently approved for individuals between 9 and 26 years of age (Centers for Disease Control and Prevention, 2014).

In the full sample (n = 285), participants were, on average, 19 years old (standard deviation (SD) = 1.90 years). The majority were Caucasian (79.9%), heterosexual (95.1%), and single (91.8%). Most participants had health insurance (85.2%) and nearly two-thirds (65.7%) had been sexually active in the past 3 months. There were no differences between those who were sexually active and those who were not regarding HPV vaccine uptake, completion, or intentions (ps > .05). Concerning HPV vaccine uptake and completion, 57.5 percent (164/285) had received at least one HPV vaccine shot, and 72.6 percent (119/164) of those

who initiated vaccination completed the 3-shot series. Those who had not received any HPV vaccine shots (n = 115) reported an average vaccine intention score of 3.49 (SD = 2.01) on a 7-point scale, indicating that they were “a little unlikely” to receive the HPV vaccine.

Concerning participants' medical history, most had never (1) received a diagnosis of HPV (96.5%) or known someone with this diagnosis (83.2%); (2) had an abnormal Pap smear (91.5%) or known someone with an abnormal Pap smear (71.2%); or (3) had a family history of cervical cancer (86.3%). Additionally, none of the participants had been diagnosed with cervical cancer. Concerning participants' receipt of health care, the majority had not received medical tests and vaccines in their lifetime, including an HIV test (77.0%), a Pap smear (61.3%), and the hepatitis B vaccine (53.4%), and most (69.8%) had not received a flu shot in the past year. However, over half of participants (55.6%) reported having a regular healthcare provider, and 78.9 percent had a dental visit in the past year. In addition, most participants were non-smokers (90.8%), and the mean AUDIT score was 3.91 (SD = 4.47), suggesting that the average participant did not consume problematic levels of alcohol (Kokotailo et al., 2004). The average participant also reported an active lifestyle on the LTEQ (M = 31.66, SD = 21.94; Godin, 2011). Fruit and vegetable intake, however, was below recommended levels, with 65 percent eating an average of 1 to 2 servings of fruits and vegetables per day (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010).

Associations of health behaviors with HPV vaccine uptake, completion, and intentions

Results of univariate and multivariate analyses appear in Table 1. In univariate logistic regression analyses, HPV vaccine uptake was significantly related to receiving one or more hepatitis B vaccine shots and a Pap smear. In a multivariate logistic regression, all 10 health behaviors correctly classified 60 percent of the sample with respect to HPV vaccine uptake; however, only the receipt of one or more hepatitis B vaccine shots and a Pap smear uniquely predicted this outcome. Next, in univariate logistic regression analyses, HPV vaccine completion was significantly related to having a regular health-care provider, receiving a flu shot in the past year, never receiving an HIV test, and visiting the dentist in the past year. In a multivariate logistic regression, the 10 health behaviors correctly classified 77 percent of the sample with respect to HPV vaccine completion; however, only having a regular healthcare provider, never receiving an HIV test, and visiting the dentist in the past year uniquely predicted this outcome. Univariate linear regression analyses also were conducted to examine whether health behaviors predicted HPV vaccine intentions among those who had not received any HPV vaccine shots (n = 115). Greater HPV vaccine intentions were only associated with the receipt of the flu shot in the past year and HIV testing. In a multivariate linear regression analysis with the 10 health behaviors, these two variables uniquely predicted greater HPV vaccine intentions, and all predictors accounted for 21 percent of the variance in HPV vaccine intentions.

Discussion

This study is among the first to explore associations between HPV vaccine uptake, completion, and intentions and a range of protective and risky health behaviors among

female undergraduate students. Concerning HPV vaccine uptake, 58 percent of the sample had received at least one HPV vaccine shot; however, only 42 percent had completed the 3-shot series. HPV vaccine uptake and completion were associated with receiving other preventive medical care; however, only HPV vaccine completion was associated with having a regular healthcare provider. Students with a regular healthcare provider may be more likely to receive and follow their provider's medical recommendations due to increased trust in the provider or other relationship factors. Consistent with this interpretation, previous studies with the general population have found a strong association between healthcare provider recommendation and HPV vaccine uptake (Rosenthal et al., 2011; Williams et al., 2013). Alternatively, the present findings may reflect an underlying personality trait, such as conscientiousness. That is, students who are more conscientious may be more likely to have a regular healthcare provider and follow medical advice.

Among those who had not received any HPV vaccine shots, mixed findings were obtained regarding the relationship between HPV vaccine intentions and the receipt of preventive medical care. Specifically, increased HPV vaccine intentions were associated with receiving the flu shot in the past year and HIV testing but were unrelated to the receipt of other services. It is notable that the flu shot and HIV testing are widely administered at non-medical locations, whereas receiving other services assessed in this study typically requires travel to medical facilities. Thus, receiving convenient medical care might have decreased perceived barriers to health care, thereby increasing HPV vaccine intentions.

Regarding other health behaviors, HPV vaccine uptake, completion, and intentions were not related to exercise, fruit and vegetable intake, smoking, or alcohol intake. One potential explanation for these findings is that adhering to certain lifestyle recommendations (e.g. regular exercise) requires more effort than receiving preventive medical care, such as the HPV vaccine. In addition, the lack of associations between smoking status and alcohol intake and HPV vaccine uptake, completion, and intentions may be due to range restriction, with most participants being non-smokers and reporting low levels of alcohol intake. A paucity of research has explored associations between the use of common substances and HPV vaccine receipt, with one national survey of young women suggesting that non-smokers were more likely than current smokers to complete the 3-shot vaccine series (Williams et al., 2013). Whether this finding would be replicated in a heterogeneous sample of female undergraduate students requires study. Also of note, those who completed the HPV vaccine series were less likely to have been tested for HIV compared to those who did not complete the vaccine series. This finding may be due to sampling error, given that only a subgroup of participants (n = 159) were included in this analysis. However, a previous study with undergraduate women found that 58 percent of those who had completed the HPV vaccine series falsely believed that HPV and HIV have similar effects on one's body (Dillard and Spear, 2010), suggesting that some may confuse the two diseases. Future studies should explore whether women who confuse HPV and HIV are less likely to be tested for HIV after completing the HPV vaccine series.

Finally, this study highlights the need for interventions targeting HPV vaccine uptake and completion. Previous interventions to promote HPV vaccine uptake have focused on providing information about the vaccine (e.g. Krawczyk et al., 2012). Based on the current

findings, future research should test the hypothesis that interventions on college campuses may improve HPV vaccine uptake and completion through concurrently promoting the receipt of several preventive medical services, such as Pap smears, vaccinations, and dental visits. In addition, interventions could target healthcare providers through electronic medical record prompts, thus reminding providers to recommend the HPV vaccine.

Limitations of this study should be noted. The sample consisted of primarily Caucasian undergraduate students from a Midwestern university. Additionally, this study focused on female undergraduates, given that the HPV vaccine has primarily been marketed to women and girls (Williams et al., 2013). Furthermore, data were collected via self-report measures on one occasion. Future studies should consider including objective measures of HPV vaccine receipt (e.g. medical chart review) and longitudinally examining predictors of HPV vaccine intentions and receipt in a more culturally diverse sample of both male and female undergraduates. Finally, studies may incorporate variables that might help explain the relationship between HPV vaccine receipt and the use of other preventive medical services, such as conscientiousness and trust in one's healthcare provider.

The current findings suggest that HPV vaccine uptake, completion, and intentions are related to the receipt of other preventive medical care among female undergraduate students. Future intervention trials may examine whether promotion of a range of preventive medical services leads to increased HPV vaccine uptake and completion in this population. In addition, interventions that prompt healthcare providers to offer the HPV vaccine warrant evaluation.

Acknowledgments

Funding: The work of the first author (J.G.W.) was funded by a fellowship from the Behavioral Cooperative Oncology Group Center for Symptom Management and the Walther Cancer Foundation. The work of the second author (S.M.C.) was funded by the Training in Research for Behavioral Oncology and Cancer Control Program—R25 (R25 CA117865; V. Champion, PI) from the National Cancer Institute. The work of the last author (C.E.M.) was funded by K07CA168883 from the National Cancer Institute.

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Table 1

Logistic and linear regression analyses predicting HPV vaccine uptake, completion, and intentions.

Outcome	Predictors	Univariate analyses				Multivariate analyses			
		B	**SE**	**Wald**	**Odds ratio**	***B***	**SE**	**Wald**	**Odds ratio**
HPV vaccine uptake[a] (receipt of 1–3 shots vs no shots) (*n* = 277–285)	Hepatitis B vaccine[b]	0.77*	0.25	9.65	2.15	0.59*	0.26	5.00	1.80
	Flu shot in past year[b]	0.44	0.27	2.72	1.56	0.38	0.29	1.78	1.46
	Pap smear[b]	0.74*	0.25	8.42	2.09	0.69*	0.31	5.09	1.99
	HIV test[b]	−0.04	0.29	0.02	0.96	−0.49	0.34	2.00	0.62
	Regular healthcare provider[b]	0.14	0.24	0.31	1.14	0.10	0.26	0.14	1.10
	Dental visit in past year[b]	0.55	0.29	3.54	1.73	0.42	0.31	1.86	1.53
	Smoker[b]	−0.16	0.41	0.15	0.85	0.08	0.47	0.03	1.08
	Alcohol intake (AUDIT)[c]	0.00	0.03	0.00	1.00	−0.01	0.03	0.05	0.99
	Weekly exercise (LTEQ)[d]	0.00	0.01	0.01	1.00	0.00	0.01	0.03	1.00
	Average daily servings of fruits and vegetables	−0.07	0.18	0.14	0.94	−0.15	0.20	0.59	0.86
HPV vaccine completion[e] (receipt of all 3 shots vs 1–2 shots) (*n* = 159–163)	Hepatitis B vaccine[b]	0.32	0.35	0.82	1.37	0.15	0.41	0.14	1.17
	Flu shot in past year[b]	0.88*	0.42	4.41	2.41	0.84	0.48	3.07	2.32
	Pap smear[b]	0.09	0.35	0.06	1.09	0.24	0.46	0.26	1.27
	HIV test[b]	−0.78*	0.39	3.90	0.46	−1.16*	0.52	5.06	0.31
	Regular healthcare provider[b]	0.96*	0.36	7.16	2.62	1.05*	0.40	6.75	2.85
	Dental visit in past year[b]	1.03*	0.43	5.70	2.79	0.94*	0.48	3.86	2.56
	Smoker[b]	−0.05	0.62	0.01	0.95	−0.16	0.73	0.05	0.85
	Alcohol intake (AUDIT)[c]	0.07	0.05	2.28	1.07	0.09	0.06	2.84	1.10
	Weekly exercise (LTEQ)[d]	0.02	0.01	2.95	1.02	0.01	0.01	0.58	1.01
	Average daily servings of fruits and vegetables	0.23	0.29	0.65	1.26	−0.05	0.33	0.02	0.95

	Univariate analyses			Multivariate analyses				
	B	SE	*t*	*B*	SE	*t*	*F*	R^2

Outcome	Predictors	Univariate analyses				Multivariate analyses			
		B	**SE**	**Wald**	**Odds ratio**	***B***	**SE**	**Wald**	**Odds ratio**
HPV vaccine intentions[f] (n = 112–115)	Hepatitis B vaccine[b]	0.56	0.39	1.42	0.72	0.39	1.83	2.76*	0.21
	Flu shot in past year[b]	1.15*	0.42	2.71	1.40*	0.43	3.29		
	Pap smear[b]	0.13	0.42	0.30	−0.52	0.47	−1.09		
	HIV test[b]	1.04*	0.44	2.35	1.24*	0.49	2.51		
	Regular healthcare provider[b]	−0.43	0.37	−1.14	−0.37	0.38	−0.98		
	Dental visit in past year[b]	−0.51	0.43	−1.21	−0.63	0.42	−1.51		
	Smoker[b]	−0.08	0.61	−0.13	−1.16	0.69	−1.69		
	Alcohol intake (AUDIT)[c]	0.06	0.04	1.38	0.09	0.04	1.90		
	Weekly exercise (LTEQ)[d]	−0.01	0.01	−0.83	−0.01	0.01	−1.27		
	Average daily servings of fruits and vegetables	−0.22	0.28	−0.78	0.15	0.30	0.51		

HPV, human papillomavirus.

[a] Coded as 1 = 1–3 shots; 0 = no shots.

[b] Coded as 1 = yes; 0 = no.

[c] AUDIT = Alcohol Use Disorders Identification Test. Higher scores indicate more drinking.

[d] LTEQ = Leisure Time Exercise Questionnaire. Higher scores indicate a more active lifestyle.

[e] Coded as 1 = 3 shots; 0 = 1–2 shots.

[f] HPV vaccine intentions were assessed with the question “How likely is it that you'll actually get the HPV vaccine?” Response options ranged from 1 (*very unlikely*) to 7 (*very likely*).

* $p < 0.05$.